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IS THERE A WORD-ASSOCIATION STRUCTURAL DEFICIT  
IN SCHIZOPHRENIA?

by



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A THESIS

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THE UNIVERSITY OF ALBERTA  
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Is There a Word-Association Structural Deficit in Schizophrenia?" submitted by Dennis G. Cruise in partial fulfilment of the requirements for the degree of Master of Science.



## ABSTRACT

It has been argued in review of recent research findings that most studies purporting to show associative abnormalities in schizophrenic verbal behavior, in addition to control difficulties, have employed tasks requiring performance at a more complex level than the level of behavioral malfunction subsequently inferred. The present study tested for evidence of abnormality of verbal associative structure in schizophrenia through better control of non-schizophrenic subject variables and through simplification of previously used test paradigms to minimize variables intervening between inferred associative structure and performance on the experimental task.

Forty Ss, twenty schizophrenic and twenty non-schizophrenic, hospitalized psychiatric patients were administered a PA learning task under two conditions: a) a list with stimulus words and response words arbitrarily paired (by E), and b) a list with a pool of given response words subjectively paired to a fixed stimulus word list. In addition, a measure of restricted WA communality (within groups) was taken from subjective pairings of stimulus and response words on the PA learning task.

No significant differences were found between groups on either PA learning task. This finding was interpreted as refuting the hypothesis of a schizophrenia-specific abnormality of word association structure. A slightly (significant) greater WA communality score was found for the schizophrenic group. Several alternative interpretations for this finding were offered, both in theoretical terms and in terms of diagnostic, subject selection, and WA communality scaling procedures.



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## CHAPTER I

### INTRODUCTION

Most researchers in psychopathology today lean toward the postulation of the schizophrenic breakdown as an additive or interactive effect of hereditary organic defects and psychologically stressful environmental conditions.

Exclusively psychogenic theories of etiology of schizophrenia based upon studies of such factors as parent-child dynamics have encountered grave difficulties in recent years. These difficulties arise principally in the area of premature presumptions of direction of causality between environmental variables and disease variables. For a recent discussion of these difficulties and a review of several properly controlled studies (e.g. mother-child interactions in schizophrenic vs. other chronically-ill children) see Mednick (1968).

On the other hand, a great deal of physiological theory concerning the etiology of schizophrenia has been invalidated as a result of new technical developments as well as for poor control of institutional environmental factors bearing on metabolism. However, there is a substantial body of data which continues to point to neurophysiological factors (Osmond, 1967; Buss and Lang, 1965). Developments in human genetics and their applications to the study of etiology of schizophrenia are particularly compelling in their support of a genetically determined metabolic disorder underlying schizophrenic syndromes (Heston, 1969; Buss, 1966; Osmond, 1967). However, certain principles of amelioration of genetic determinacy, such as



"penetrance" (Buss, 1966) which are necessary to account for the data suggest the probable salience of environmental potentiation of the genetically based organic processes.

On the basis of these considerations, the theoretical position of this thesis is that while psychological research into schizophrenic symptomatology is not likely to elucidate primary etiology, it is crucial to the elucidation of dimensionality and directional relationships among psychological variables. Since verbal and cognitive symptoms still constitute the primary diagnostic criteria in schizophrenia (Maher, 1966), research into these areas is of crucial value for the cross-validation of research findings in physiological and/or early environmental etiology of schizophrenia.

Bleuler was the first to postulate associational disturbance as the primary psychological deficit in schizophrenics. He regarded cognitive manifestations such as "bizarre" ideas, loose associations, fragmented thinking, blocking of associations, etc. as the primary schizophrenic symptoms, and as causes which lead to such symptoms as hallucinations and delusions (Bleuler, 1950). The first systematic attempt to investigate these effects in schizophrenics was undertaken by Kent and Rosanoff (Kent and Rosanoff, 1910).

In the past three or four decades there have been numerous studies which have attempted to demonstrate and explain pathology of associations in schizophrenia. One of the persistent difficulties with studies in this area has been that the complexity or level of functioning required by the study's task has usually been greater or higher than the level of disturbance of function subsequently inferred (Yates, 1966). In an attempt to



mitigate this difficulty, the present study sought to isolate and assess the effects, if any, of disturbances of word association structures upon verbal behavior as a primary symptom of schizophrenia.

This thesis is specifically directed toward clarification of areas where inferences from studies purporting to investigate word association repertoires or structures are confounded by selection and production (i.e. process) variables involved in the performance task (Rosenburg and Cohen, 1966).

A considerable amount of the confusion inherent in the present research literature on language behavior in schizophrenia can be eliminated by casting the following discussion in terms of a structure-process dichotomy (Pollio, 1968). Structure with respect to word associations refers to the relatively stable, mediational (horizontal) and hierarchical (vertical) organization of language elements, primarily words. Presumably word-association structures are based upon meaning relationships which change over time, but with respect to a given task, they can be considered to be static, or "wired in". Process, on the other hand, refers to language capabilities and behaviors as they are employed in manipulation of verbal structural elements (eg. in production of free associations, learning of new associations, etc.) in which the elements manipulated are previously known, eg. common words. Structures, such as word-association patterns and hierarchies, are inferred through language behavior processes, such as performance on a free word-association task. The point of focus of this thesis is that in order to isolate and investigate verbal structures, it is necessary to constrain process variables to minimize intervention of task-situation variables such as set and response interference, and



extraneous variables such as intrusion of responses to irrelevant stimuli.

The present study, therefore, approached the investigation of word association structure in schizophrenia through two performance tasks with process variables more closely constrained than in the usual experimental paradigms used in this area.

(A) The effects of latent word association structure on paired associates learning in schizophrenics was investigated by the performance of schizophrenic and non-schizophrenic psychiatric patients in learning a list of subjectively-paired common words as compared to learning a list of arbitrarily-paired common words. In this task the theoretical rationale was as follows:

1) In the arbitrary-pair condition it was presumed that the overall influence of forward association upon performance would be negligible (normative forward association value for all pairs was zero) and performance would therefore depend upon process variables such as rote learning and mediation. On this basis, and with regard to the preponderance of findings in the literature, it was predicted that schizophrenics would perform significantly worse than non-schizophrenics.

2) In the subjective-pair condition it was presumed that the effects of process variables (hypothesized above to favor non-schizophrenics) on performance would be overshadowed by subjective word association structure as reflected in subjects' pairings of stimulus and response words. On the basis of this presumption, and the hypothesis that schizophrenics word-association structures are not deviant, it was predicted that the performance of both groups would improve in the subjective-pair condition, but that schizophrenics improvement would be greater than non-



schizophrenics' relative to performance in the arbitrary-pair condition.

(B) Communalility of latent word-association structures in schizophrenics was investigated by analyzing agreement (across subject) of schizophrenic vs. non-schizophrenic psychiatric patients in the "subjective" pairings of specific words in the previously mentioned paired-associates learning task. In this task it was presumed that subjective selection of responses for specific stimulus words would directly reflect the relative strength of the various possible word combinations in the subjects' word-association structures.

On the basis of this presumption and the hypothesis that schizophrenics' word-association structures are not deviant, it was predicted that schizophrenics would show as much communalility of specific word associations as would non-schizophrenics.

Normal controls were not run for two reasons: a) the primary interest was in deviance of word-association structures specifically attributable to schizophrenia, and b) factors of institutionalization and general psychopathology were controlled (matched) for both groups.



## CHAPTER II

### REVIEW

The existence of a broad range of schizophrenic deficit, including in the performance of learning, recall and association tasks involving verbal material has been widely demonstrated (Buss and Lang, 1965; Mednick, 1968).

These studies of schizophrenic deficit have in general concentrated on differences between normals and schizophrenics, or on multiple range comparisons among normals and groups of schizophrenics differing on clinical dimensions of schizophrenia (eg. good-bad premorbid, chronic-acute, paranoid-nonparanoid). The present review will deal with learning and recall, word-association, and concept formation and discrimination studies, all involving common language units (words), and all of which, whether they purport to do so or not, are interpretable as providing some insight into associational structures in schizophrenia. This review closely follows the approach of Buss and Lang (1965) in that it attempts to distinguish studies which use word association and association learning formats but which are more parsimoniously interpreted in terms of such factors as response interference as a process variable. Many studies excluded here which do not appear to bear upon schizophrenia-specific factors in word association structure but which are of tangential interest will be presented in subsequent chapters on control problems, and on discussion and interpretation of the present findings.



### Word Association Studies

A number of studies have found schizophrenics to give less common associations on both free association tasks (Moran, 1953; Sommer et al, 1960; Wynne et al, 1963; Maltzman et al, 1963; Moran et al, 1964; Johnson et al, 1964; Dokecki et al, 1965), and on restricted association tasks (Lester, 1960; Wynne, 1963). Schizophrenics have shown less shift under instructional set to give normal or unconventional associations (Wynne, 1963; Wild, 1965), but greater ability to judge the normality of their own associations (Sommer et al, 1960).

Where attempts have been made to condition subjects to give common associations, non-schizophrenics have shown more performance shift in the intended direction (Sommer et al, 1962; Maltzman et al, 1962).

Finally, schizophrenics have been shown to exhibit more test-retest variability in word associations to a given set of stimuli (Sommer et al, 1960; Storms and Broen, 1964). Other studies have found this effect to be minimal (Moran et al, 1964), and to hold only for more chronic schizophrenics (Dokecki et al, 1965).

In general, the studies of word associations in schizophrenia are inconclusive, but to the extent that the evidence bears upon word association structure, it would appear to favor generally flatter, less stable word association hierarchies in schizophrenics (i.e. less prominent and retest reliable primary associations to stimulus words.)

### Associative Organization in Recall

Schizophrenics have shown no organizational deficit in free recall on lists offering high opportunity for associative organization (Lauro,



1962). However, on lists offering low opportunity for associative organization (Lauro, 1962), and lists of mixed "difficulty" (Bauman and Murray, 1968), schizophrenics have demonstrated significant deficit. Kimmis (1969) found somewhat inconclusive differences favoring non-schizophrenics on both types of lists and on combined scores.

These studies indicate that schizophrenics may not be deficient in employing high-strength associations, but may be deficient in employing low levels of association in organizing materials for free recall.

#### High Association Strength Response Interference and Transfer

Studies of associational response interference, where alternate "incorrect" responses with high association value to the stimuli have been presented, have generally shown schizophrenics' performance to be more susceptible to response interference.

Schizophrenics have shown higher associational response-interference in tasks involving concept formation (Chapman, 1958), discrimination learning (Downing et al, 1963), word association to stimulus words with multiple meanings (Faibisoff, 1961), and paired-associates learning (Spence and Lair, 1964; Lang and Luoto, 1962; Deckner and Blanton, 1969), than non-schizophrenics.

However, at the same time schizophrenics have shown as much transfer as normals from high associations in conceptual and discrimination tasks where the "correct" response was highly associated to the stimulus word (Cohen and Camhi, 1967; Deckner and Blanton, 1969).

The Deckner and Blanton study is particularly revealing in that it demonstrated that schizophrenics' performance was disrupted on a task where the alternative responses provided were highly associated to the



"wrong" stimulus words, but that schizophrenics performance was facilitated as much as that of normals on the same task (PA learning) when the responses provided were highly associated to the "correct" stimulus words.

This finding implies a summary statement for the findings in this section: schizophrenics are as capable as non-schizophrenics of taking advantage of high associations leading to "correct" responses, but are less capable of maintaining a set to suppress attention to high associations leading to "incorrect" responses.

In general, research findings which seem to bear upon the effect of word association structures upon performance in various tasks, though they are equivocal, tend to favor lower normative communality in schizophrenics. However, these effects have generally been found to be rather slight in magnitude; the more important effect being a substantial core of similarity on associative-structure related performances. Furthermore, these effects seem more pronounced where levels of association are lower and tend to diminish as association level of the task material is increased. This effect is directly illustrated in the previously-mentioned study by Lauro (1962). An exception to this general observation is the case where high-associates are available as alternate "incorrect" responses to the stimuli, in which case the schizophrenics demonstrate a notable "set" deficit leading to greater response interference. To the extent that these findings bear upon associational structures, they could best be conceived of as the flattening (see page 7) of gradients of associational strength between a stimulus word and alternative response repertoire words.

The critical studies with respect to the present thesis are those



by Cohen and Camhi (1967) and Deckner and Blanton (1969). These studies exhibit in common the task features of selection of a response from a constrained set of responses (i.e. reduced opportunity for process errors such as response intrusions), the absence of associative competition by incorrect response alternatives (i.e. response interference minimized), and the necessity of intact (i.e. normal) associational structures to perform well. However in both studies, the test of intactness or normalcy of associational structure is based upon discrimination between responses differing widely in forward association strength to the stimulus. The present study sought to generalize these findings by providing two different tests of facilitating effects of association structure in situations where the response field was enlarged but still constrained, and subjects performance would therefore demonstrate discrimination between responses with a smaller range of difference in forward association strength to the stimulus.



## CHAPTER III

### CONTROL AND METHODOLOGICAL PROBLEMS

In view of the enormous difficulties which confront the investigator, in terms of the social and institutional milieu, and clinical-theoretical obscurities surrounding mental illness, no investigation in the area of psychopathology is complete without strenuous attempts to control elements of this milieu which are not addressed by the experimental design, and no review is complete without a comprehensive discussion of the range and importance of control problems. It is difficult to articulate the dimensionality that underlies, or to cleanly categorize the gamut of obstacles which promise to confound the results of even the simplest investigation. The present approach will be to simply list them and discuss them in an intuitively derived order of potential importance.

#### (A) Psychotropic Drug Effects

The pharmacological revolution in custodial care and symptom suppression which has occurred in the past twenty years has brought about great difficulties in the investigation of primary symptomatology of mental illness, particularly in schizophrenia. The contagious "bedlam" of the chronic ward of the 1940's has been replaced by the "phenothiazine shuffle" of the 1960's. Where the typical massive drug regime of the schizophrenic patient undoubtedly impairs a wide variety of functions of experimental interest, it also undoubtedly suppresses a wide variety of salient primary symptomatology. There is a dearth of empirical documentation of specific psychological effects of various drugs, and at present



the prudent researcher has no alternative but to arrange at least a minimum "dying out" period for institutionized subjects to be tested. For the purposes of the present study, there is some evidence that electro- and chemo-therapy suppress primary symptomatology and tend to restore "normal" word associational behaviors (Moran et al, 1964). Therefore all subjects included in the present study were withdrawn from medication for a minimum of seven days.

#### (B) Length of Institutionalization and Chronicity

In combination with and independent of drug variables the variable of institutional "chronicity" has probably lead to more errors of inference and wasted effort than any other problem in research in psychopathology. In a survey of 115 recent studies of schizophrenia reported in five leading Journals of psychopathology, Mednick (1968) found that 63 percent did not report length of hospitalization of their subject samples. In the remaining 37 percent, chronicics were hospitalized an average of 7.1 years, acutes were hospitalized an average of 2.3 years, and normals usually were not hospitalized at all. It has been found that institutional incarceration, including prisons, medical hospitals, has profound effects on a range of psychological variables from perceptual and conceptual behavior (Silverman et al, 1966) to personality changes (Sommer and Hall, 1958). Findings such as these severely limit our justifiable confidence in the research literature on schizophrenia and in psychopathology in general. There is probably no major feature of symptomatology demonstrated to significantly differentiate chronic and acute schizophrenics which can be confidently ascribed to the schizophrenic process itself and not to the effects of differential exposure to institutional and drug milieu.



(Mednick, 1968). Certainly from the perspective of this study, no further demonstration, in the same vein, of differences between chronics and acutes, or between institutionalized schizophrenics and non-institutionalized normals, is necessary (Buss and Lang, 1965). What is necessary is the articulation of deficiencies specifically found in schizophrenics and not in other patients who have comparable histories of institutionalization, but who are not supposed to exhibit the postulated deficiency. Practically speaking, the demonstration of emerging and continuing disease effects specific to schizophrenia would require the minimum strategy of a two by two factorial design with two levels of diagnosis (schizophrenic and non-schizophrenic) and two levels of duration of institutionalization, with drug effects eliminated or at least held constant.

Matched samples of non-psychiatric normals may be of some interest, but the all too frequent use of college students as controls at this point in the history of psychopathology is virtually meaningless. This study was reasonably successful in controlling this variable as evidenced by data presented subsequently on diagnostic and institutional history (Table I, page 24) but no attempt was made to assess the specific progressive effects of schizophrenia (i.e. acute vs. chronic).

### (C) Age

Factor analysis of scores on a large group of psychological and sensorimotor tests for carefully matched groups of normals and depressives aged fifteen to sixty-five (Weckowicz et al, 1970) demonstrated a broad age effect independent of clinical diagnosis. Although findings on specific variables cannot be generalized to schizophrenics, it is safe on the basis of this data to anticipate unknown but pervasive age effects



in any research in schizophrenia. Many reported studies of a broad range of acute vs. chronic schizophrenic effects, and of schizophrenics vs. comparison groups where age is not controlled, are undoubtedly heavily contaminated by age effects. The present study erred (but on the "safe" side) by compiling a control sample with a slightly higher mean age--probably due to a preponderance of depressives in whom institutionalization more typically occurs toward middle age.

#### (D) Intelligence and Other Salient Ability Variables

In studies of most areas of schizophrenic behavior the investigator can only make an educated guess on the basis of "normal" research concerning what "ability" variables might be effective. Among relatively homogeneous normals, intelligence has not been shown to be a powerful covariate of performance on a paired-associates learning task. In the present study, however, since the patient populations appeared likely to be extremely heterogeneous in verbal abilities related to the performance task, it was decided to employ the QT picture recognition verbal IQ test (Ammons and Ammons, 1962) as a matching device for groups and for possible use in an analysis of covariance to reduce error variance.

#### (E) Motivation

Researchers into psychological deficit in schizophrenia have often cautioned that their findings might be contaminated by motivational differences, in terms of such effects as ego-involvement in success vs. failure. After an intensive review of studies of the effects of motivation in schizophrenics performance, Buss and Lang (1965, p. 96) conclude that

. . . the hypotheses that schizophrenics are indifferent to social stimuli . . . have very limited value. Experiments relevant to both views (eg. relative improvement in schizophrenic performance following punishment) are more parsimoniously interpreted in the context of



interference theory . . .

In consideration of the latter comment, the problem of minimizing the effects of task performance variables influencing but not elucidating the effect of experimental interest, one of the major problems in the present study, has been discussed elsewhere in this paper.

(F) Diagnostic Sub-Type

a) Schizophrenics. In studies of verbal and cognitive behavior with schizophrenics, the paranoid-nonparanoid dimension is of particular importance. Bizarre cognitive and verbal behaviors constitute the primary diagnostic criteria of schizophrenia (Maher, 1966). Paranoid "schizophrenics" have such relatively intact personality structure, including verbal and cognitive abilities that there is considerable justification for the proposition that they are either at the extremely "mild" end of some continuum of severity (i.e. just a "little bit" schizophrenic), or are suffering from a disease process which is possibly similar but which displays a qualitatively different symptomatology from "true" schizophrenia (Buss, 1966; McGhe, 1969). Considering also the diagnostic fringe groups such as "schizo-affective" and "schizoid personality" it is apparent that in order to make any general statement of results it is necessary to stay within the framework of more "typical" sub-categories of schizophrenia. The alternative is to be prepared to deal with all the problems of taxonomic relevance to various test situations. An excellent discussion of this problem is presented by Heston (1969).

b) Control Subjects. There are demonstrated similarities between various organic syndromes (brain damage, epilepsy, etc.) and schizophrenic symptoms (Lester, 1960). It is necessary to determine whether



the conceptual plan of any given study allows for inclusion of such subjects in a control group or whether the two groups should be presumably free from convergent symptom similarities.

The present study attempted to meet the aforementioned difficulties by employing only non-paranoid patients with an exclusive diagnosis of schizophrenia in the experimental group, and by excluding patients in both groups with organic syndromes which could be reasonably foreseen to affect verbal and cognitive functioning.

#### (G) Sex Differences

S, E, and S x E sex variable effects are widely recognized in both normal and abnormal psychological research as variables which must be documented or controlled. This variable is likely to be particularly salient in studies of institutionalized patients where the sexes are separated and subject to a completely different unisexual social milieu. The present study sacrificed generality and controlled for sex effects by including only female patients in both groups.

#### (H) Blind Techniques

Effects of S, E, and S x E expectations are widely recognized as important factors in any psychological research. Research in psychopharmacology and psychopathology have been particularly negligent of these factors with sometimes disastrous results (Glick and Margolis, 1962; Mahon and Daniel, 1964).

This study attempted to control for E expectancies, but these attempts were only partially successful (see page 22).



## CHAPTER IV

### METHOD

#### Design

The present study employed a  $2 \times 2 \times 2 \times 2$  factorial design. This design involved two factors of theoretical interest (diagnosis, and arbitrary-idiosyncratic treatment), and two control factors (order of pairs and order of treatments). Subjects were nested equally ( $n = 20$ ) within levels of the factors of diagnosis, order of treatments, and order of pairs, with repeated measures for levels of the factor of arbitrary-subjective treatment.

#### Subjects

Two populations were represented in the subject sample: twenty female subjects with an exclusive diagnosis of schizophrenia (non-paranoid) and who at the time of testing had been continuously hospitalized for at least three months; and twenty female subjects consisting of "other" psychiatric patients who had been continuously hospitalized for at least three months and who were not diagnosed as having any organic symptoms which might be presumed to affect verbal or cognitive functioning. For details of make-up of subject sample (age, diagnostic sub-categories, etc., see Table I, page 24). Both subject groups were matched as nearly as possible for age, verbal I.Q., and length of continuous hospitalization at the time of testing. A final requirement was that in the judgment of nursing staff, the patient be minimally



ambulatory and exhibit some inter-personal verbal behavior. All patients selected were withdrawn from all medication for at least seven days prior to testing. Several patients were not tested because of severe drug-withdrawal reactions. Subjects were obtained in a quasi-random fashion from ward rosters, and an attempt was made to avoid having nursing staff "select" patients (eg. "good" patients, "interesting" cases, etc.).

### Materials

Association Learning Lists: The PA word lists were constructed from sixty-four Palermo-Jenkins (1964)-(PJ) nouns and adjectives randomly divided into thirty-two words for the "constrained" association learning task, and thirty-two words for the "subjective" association learning task. The thirty-two words for each association learning task were randomly divided into sixteen stimulus words and sixteen response words.

For both the "constrained" and the "subjective" tasks, the sixteen stimulus words were block-typed one inch apart on the left side of two 8" x 11 $\frac{1}{2}$ " cards, and the sixteen response words were block-typed individually on 1" x 3" cards for subjects to handle in matching response words with stimulus list words. The sixteen randomized stimulus words for each treatment were arranged in forward and backward order, each to be presented to half of the subjects in each group and in each treatment. Since the response words were randomly assigned to words in the stimulus list for the "arbitrary" treatment, the precaution was taken of scanning the PJ response lists to ensure that no response word occurred in the PJ normative response data to its respective stimulus word.



Intelligence Test: The Ammons and Ammons (1962) picture-recognition test of verbal intelligence (QT) was used.

Score Sheets: All data was recorded on prepared score sheets.

### Procedure

The general experimental paradigm employed was the paired-associates recognition learning task employed by Horowitz (1962).

(See appendix for all instructions used.)

Practice lists: All subjects were first given a five-word arbitrarily-paired PA learning task for the purpose of demonstrating to subjects the procedure, and to screen out subjects with such defects as very poor eyesight, or inability to learn paired-associates due to poor English or gross deterioration. All subjects who attained a criterion of five out of five correct pairings within five trials (according to "arbitrary" procedure below) were included in the study. At this point five schizophrenics and six non-schizophrenic subjects were eliminated from the study. All those subjects except one who passed this criterion test also met the liberal criterion for inclusion in the study on the actual treatment tests outlined below.

Arbitrary-Pairing Treatment: a) learning trials: In the arbitrary pairing treatment the response cards were placed in succession beside the appropriate stimulus list words at four second intervals, for the first learning trial only. On each successive learning trial the response words to stimuli which were not responded to correctly on the previous test trial were randomly presented again paired with the appropriate word on the fixed stimulus list. A four-second item-presentation interval was maintained on all learning trials. b) test trials: After



each learning trial, all the response word cards were shuffled randomly and presented to subject for a new test trial. Subjects were instructed to attempt to match the words as they were paired originally, in any order they chose, and were urged to work reasonably quickly and to not waste time puzzling over any of the pairs.

**Subjective-Pairing Treatment:** a) learning trials: For the first learning trial subjects were presented with the shuffled stack of response-word cards and told to match them with words on the stimulus list in any way they thought they could remember them. At this point they were told that they would have to try to pair them later in exactly the same way. Subjects were told to work reasonably quickly so that they would not forget the pairs they had done. As subject placed each response-word card next to stimulus words on the fixed stimulus list, the card was removed, a card was placed over the stimulus word so the subject wouldn't use it again, and the code number of the response card subject used was recorded on the score sheet next to the appropriate stimulus word. All succeeding learning trials were conducted in exactly the same manner as previously described for succeeding learning trials under the arbitrary condition. b) test trials: The first and all succeeding test trials were conducted in exactly the same manner as described previously under the arbitrary condition.

In all learning trials for both conditions subjects were instructed to read the pairs aloud as they were presented and were prompted to do so if they did not. This precaution was taken to minimize the effect of variables of set and attention.

In all test trials, response cards were removed and errors or



correct pairing recorded immediately after each attempt. The complexity of task demands upon E prevented the recording of the specific nature of errors.

Task Decision Criteria: All subjects were run a minimum of four and a maximum of six trials in both treatment conditions. It was decided a priori that at least eight correct responses on any one trial for both conditions would be required to demonstrate enough learning to justify use of any subject's data. Only one subject, a control, failed to achieve a minimum of eight correct responses on any trial for either treatment list.

The number of trials a given subject received for each treatment was a practical matter and depended on two factors: a) speed at which subject worked: If subject had completed at least four but less than six, trials with at least eight correct on one trial within approximately forty-five minutes, he was stopped at the end of that trial and started on the other treatment list. If he had not achieved eight correct by that time, he received further trials (until he had achieved eight correct to a maximum of six trials). If he had completed six trials before that time, he was then started on the other treatment list. b). performance of subject: If subject had achieved two successive trials of fifteen correct pairs, or one trial with all sixteen pairs correct by the fourth trial, he was stopped and started on the other treatment list. In the case of either a) or b) above, subject was then given successive trials on the other treatment list until 1) he had received at least four trials on the other treatment list, and 2) he had achieved at least eight correct on one trial of the second condition list, and either 3) he had achieved the full learning criterion above, or 4) he evidenced or complained of



fatigue or a desire to terminate the task, or 5) he had been engaged in both treatments for approximately  $1\frac{1}{2}$  hours. Due to these practical limitations, only four complete trials for all Ss were retained for the data analysis.

I.Q. Test: Approximately two minutes after completion of the PA learning task, each subject was given the QT and the raw score was recorded on his data sheet.

An attempt was made to run this study single blind with respect to experimenter knowledge of subject diagnosis. Toward this end nursing staff were given criteria of subject selection and asked to select them in quasi-random order and present their names to E. Data on diagnosis, age, and length of institutionalization was collected after the testing session. This measure was only moderately successful in that the single-blind was occasionally broken through such factors as inadvertent remarks by unbriefed nursing staff. Furthermore, toward the conclusion of the study it was necessary to break the single-blind in order to select subjects to complete cells of the experimental design.



## CHAPTER V

### RESULTS

#### Control Data

Table I presents a summary of control data for both diagnostic groups. It is evident that control measures were reasonably effective in that statistical comparisons of both groups for verbal I.Q. and length of hospitalization (both recent-continuous and total) show negligible differences. There is a moderate difference in mean age favoring the experimental group ( $p < .10$ ) but the extreme overlap in age ranges of groups suggests that this is not a crucial consideration. Data on inter-correlations among these variables and performance variables on the experimental tasks are presented (Table V, page 32) and discussed in a later section.

#### PA Learning Task

A summary of the raw data for the PA learning task appears in Table II, page 27. The summary of the analysis of variance appears in Table III, page 28. Total correct responses for the first four trials was the data measure employed in the above analysis for the following reasons:

- a) For practical reasons many subjects only completed four trials in one or both treatment conditions (see page 21).
- b) Performance of subjects at any given stage (trial) was so heterogeneous that to use a "trials to criterion" measure would have



TABLE I

## CONTROL DATA

Control Variables		Schizophrenic	Non- Schizophrenic	t	df	p
Age	x	38.25	42.05	2.01	38	.10
	Range	18 - 56	18 - 65			
		9.97	12.03			
QT	$\bar{x}$	35.35	35.85	.25	38	.50
	range	19 - 47	23 - 47			
		6.25	6.34			
Hospitalization (continuous)						
	$\bar{x}$	34.70 mos.	34.40 mos.	.02	38	.50
	range	3 - 229	3 - 158			
		40.46	54.25			
Hospitalization (total)						
	$\bar{x}$	78.05	86.45	.40	38	.50
	range	8 - 229	3 - 302			
		51.00	79.50			



resulted in a great loss of data in equating subjects for criterion of successful learning.

c) Scanning of the raw data (see Table II, page 27) indicated nothing of further interest such as ceiling effects or trial by trial trends differentiating groups.

The primary (effect) predicted was an interaction between diagnosis and type of list. It was predicted that schizophrenics would perform more poorly than non-schizophrenics on the arbitrarily-paired PA learning list and relatively less poorly or as well as non-schizophrenics on the subjectively-paired list. It can be seen from Table III, page 28, that this interaction (AB) was not significant. It is clear that the presumption upon which this hypothesis was based (i.e. that previous findings of a schizophrenic deficit would be confirmed, at least for the arbitrary list) proved to be incorrect.

In this experiment, however, two statistically significant effects did occur:

a) greater PA learning performance for the subjectively paired list than for the arbitrarily-paired list. This effect was interpreted as a systematic effect due to characteristics of the two lists (see Discussion). b) an interaction between order of treatments, and order of items on the stimulus lists. This latter effect was interpreted in the light of two considerations: first, there were six opportunities for two-way factorial interactions to occur by chance, and second, all test trials were conducted with random presentations of response terms. In view of these considerations, this interaction effect was interpreted as an improbable, but non-systematic event.



The possibility of an analysis of covariance using the QT scores as the covariate was considered in the design of this study. However the very low correlation between QT scores and the principle performance measures ( $r = .309$ ,  $p < .05$ ), and the fact that no other effects of theoretical interest approached significance by the factorial analysis of variance, precluded the probability of further positive findings by this approach.

#### Word Association Task

The results of this part of the study indicated a substantial core of agreement within and between groups, with schizophrenics showing significantly higher WA communality than non-schizophrenics (Table V, page 32). The raw data for both groups are represented in histogram form in Figure I, page 30. These data are based upon the number of subjects who chose each of 256 possible pairings of the sixteen words in the stimulus list with the sixteen words in the response list. Since each of twenty subjects in each group formed his subjective PA learning list by making sixteen of the possible 256 pairings, the histogram data represent agreement among subjects on a total of 320 occurrences of any of the 256 possible pairs, for each group.

For the purpose of testing the difference in WA communality between diagnostic groups, a "communality" score was derived for each subject. This score was found by summing the frequency of occurrence of pairings (for both groups) for the subjects' sixteen particular pairings of stimulus list words with response list words. Thus each subject's score could theoretically range from sixteen (if he were the only subject to form each of the sixteen particular pairs which he chose) to 640 (if all



TABLE II  
SUMMARY OF PA LEARNING DATA

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Condition	Trial	Mean Number of Correct Responses (Possible 16/trial)	
		Schizophrenics	Non-Schizophrenics
Arbitrary	1	5.35	5.07
	2	8.35	7.05
	3	9.65	9.05
	4	11.70	10.35
	Total	8.76	7.80
Subjective	1	7.80	7.55
	2	10.85	10.10
	3	12.40	11.25
	4	13.75	12.85
	Total	11.20	10.44
Both Conditions		9.98	9.12

---



TABLE III  
SUMMARY OF ANALYSIS OF VARIANCE

Source	S.SQ	dif.	M.SQ	F
A	344.50	1	344.50	1.65
C	.05	1	.05	.00
D	5.50	1	5.50	.03
A x C	22.05	1	22.05	.11
A x D	151.25	1	151.25	.72
C x D	994.05	1	994.05	4.76*
A x C x D		1		
<u>S<sub>s</sub> within groups</u> (error within)	6,679.00	32	208.72	
B	1,805.06	1	1,805.06	10.07 **
A x B	.20	1	.20	.00
B x C	12.80	1	12.80	.07
B x D	57.80	1	57.80	.32
A x B x C		1		
B x C x D		1		
A x B x D		1		
A x B x C x D		1		
<u>Cx Subj. within groups</u> (error within)	5,735.00	32	179.21	

A - Diagnostic Group

B - Treatment (type of list)

C - Order of treatments

D - Order of presentation of list pairs

\* p < .05

\*\* p < .01



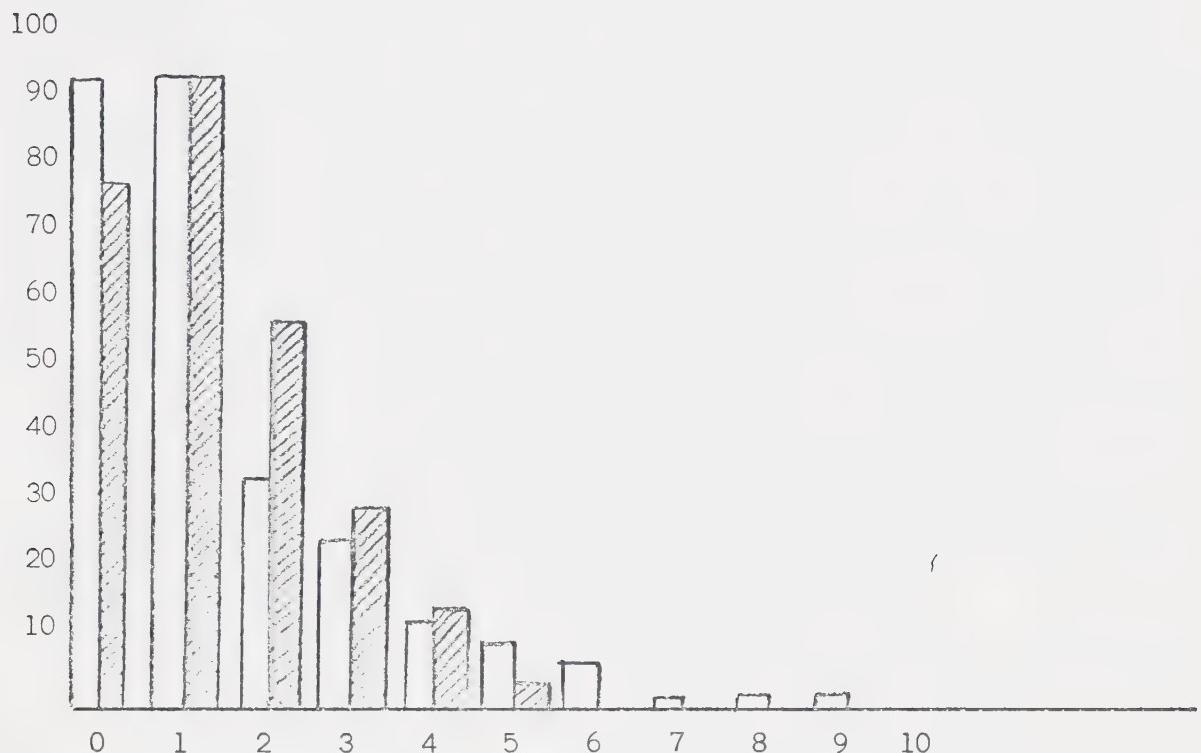
TABLE IV  
COMMUNALITY SCORES

<u>Schizophrenic</u>		<u>Non-Schizophrenic</u>	
<u>S</u>	<u>Scores against both group's responses</u>	<u>S</u>	<u>Scores against both group's responses</u>
1	70	21	78
2	69	22	67
3	95	23	68
4	84	24	60
5	80	25	51
6	93	26	48
7	88	27	72
8	89	28	50
9	77	29	60
10	84	30	77
11	81	31	86
12	55	32	54
13	71	33	45
14	95	34	67
15	87	35	73
16	54	36	36
17	61	37	60
18	65	38	70
19	46	39	80
20	81	40	63
$\bar{X}$	76.25		63.25
$\sigma$	14.36		13.03

t      df = 38  
       t = 3.00  
       p   .01



FIGURE I  
SUMMARY OF WORD ASSOCIATION DATA



NOTE: Magnitude (m) of WA agreements (Stimulus list word i x response list word i; 20 agreements possible for list I word i x list II word) i.

Schizophrenic



Non-Schizophrenic





subjects paired the response list words to the stimulus list words in exactly the same manner). This is a modification of the procedure employed by Horton, Marlowe and Crowne (1963).

Table V, page 32, gives the communality scores for all subjects, together with the results of a t test of means between groups.

#### Control Variables and Experimental Measures (Intercorrelations)

Correlations among control variables and experimental performance variables appear in Table V. Of the three control variables, age, verbal I.Q., and length of continuous hospitalization, only verbal I.Q. correlated significantly with either of the dependent variables (PA learning). For both groups, age correlated with both verbal I.Q. (supporting general findings in this area), and with hospitalization. The high correlations between total and continuous hospitalization, and between PA scores for subjective and arbitrary conditions for both groups, precluded the computation of separate correlations for these conditions.

Of especial interest is the absence of significant correlations between WA communality score and either the most salient control variable, verbal I.Q., or the other independent variable, PA learning.



TABLE V

## CORRELATIONS: CONTROL VARIABLES AND EXPERIMENTAL MEASURES

<u>Variables</u>	<u>Correlations (by group)</u>	
	Schizophrenic	Non-Schizophrenic
Age x IQ	.369*	.322**
Age x Hospitalization (continuous to testing)	.301**	.386*
Age x PA Score (overall total correct)	-.201	.011
Age x WA communality score	.068	.015
IQ x Hospitalization (continuous)	-.130	-.070
IQ x PA Score (overall total correct)	.310**	.364*
IQ x WA communality score	.228	.091
Hospitalization (continuous to testing) x Hospitalization (total)	.981*	.814*
Hospitalization (continuous) x PA Score (overall total correct)	.130	-.162
Hospitalization (continuous) x WA communality score	-.057	.020
WA communality score x PA Score (idiosyncratic only)	.210	-.185
PA (Subjective) x PA (arbitrary)	.809*	.892*

df = 38

\*p &lt; .01

\*\*p &lt; .05



## CHAPTER VI

### DISCUSSION

The findings which arose from the present study may be summarized as follows:

- 1) Control measures were reasonably effective.
- 2) No significant differences between groups with respect to PA learning were found.
- 3) Facilitation of PA learning by subjective word associations was found for both groups.
- 4) Greater communality of constrained WA's was found for the schizophrenic sample.

The paired-associates learning findings are interpreted as indicating that :

- 1) schizophrenics are not differentiated from a broad sample of institutionalized psychiatric patients on the basis of performance on a simplified PA learning task (arbitrary-pair condition), and
- 2) the performances of schizophrenics and non-schizophrenics were not differentially augmented by subjective word-association structures on a subjectively-paired PA learning task

However, the broad array of clinical and experimental evidence of "idiosyncrasy" in schizophrenics' overt verbal behavior is not directly contradicted by the findings of the present study. The fact that this broadly documented schizophrenic deficit was not manifested in the present study is interpreted as being due to two factors: a) the fact that non-



schizophrenic specific variables were more closely controlled than in most previous studies, and b) the fact that experimental performance variables were more closely constrained than in most previous studies. In this study only association learning and response selection were required of subjects; the learning and production of responses was not required. In this respect these findings are seen as lending confirmation and generality to the findings of Cohen and Camhi (1967), and Deckner and Blanton (1969).

The finding of a greater word association communality among schizophrenics appears to lend itself primarily to one theoretical basis of explanation, while there are several possible practical and methodological considerations which may account for it. In theoretical terms, this finding may reflect a greater communality of environment and communicational contact for schizophrenics, since the schizophrenic sample was concentrated in fewer wards, while a matched sample of long-term, non-schizophrenic, non-deteriorated psychiatric patients was much more difficult to locate and consequently came from a greater number of wards and a wider variety of social-institutional environments. This interpretation strongly implies that schizophrenics, contrary to considerable opinion, are amenable to "shaping" and "socialization" of verbal behavior through communication contacts in informal everyday activities (and more importantly, perhaps in an organized communication therapy group).

In practical and methodological terms, there are several possible alternative explanations of the WA communality findings. Had we included paranoid patients in the schizophrenic group (McGhie, 1969), or organic and deteriorated patients in the control group, or had there been an obvious



failure in any of the major control measures, this finding would have been less surprising. Since none of these obvious problems occurred, an explanation of this finding would have to be sought elsewhere. However the most plausible practical explanation of this finding would appear to lie in failure of clinical diagnosis (at Oliver Hospital and current diagnostic systems in general) to reliable differentiate a group of patients (schizophrenics) demonstrating a clearly unique cluster of symptoms which would include verbal associative defects. It is possible, for instance, that among an undifferentiated population of psychotic patients, the critical "schizophrenic" symptoms of cognitive disorder (see comments on page 2) may be more frequently recognizable among the more verbally active patients, thus biasing the diagnostic picture; and contributing to greater word-association communalities and a trend toward greater PA learning in "schizophrenic" patients. If a non-psychotic, and perhaps even non-institutionalized control group were employed, as has been the case in many previous studies, (see discussion on page 12) these effects might very well disappear. It is also possible that the finding of a significant difference in WA communalities between groups could be an artifact of the scaling procedures employed. The presumptions concerning the form, distributions, and independence of the raw data underlying the tests of significance employed appear to be more than adequately met (see Table IV, page 29). However the solution of problems of differential weighting of a range of scores representing a presumed underlying psychological continuum (i.e. scaling) are still in a developmental stage. Solution of such problems is a fundamental requirement for the refinement of all forms of psychological testing. It cannot be presumed that the WA



testing phase of the present study escaped the effects of such difficulties. It is apparent, however, (see Figure I, page 30) that the most conclusive finding of the present study was a "substantial core of similarity" (Kimmis, 1969) of word association performance between schizophrenics and non-schizophrenics.

In general, on the basis of this study, and those previously discussed as most pertinent to verbal structure in schizophrenia (page 10), it appears that schizophrenic deficit or idiosyncracy on verbal performance tasks cannot be explained in terms of differences in word association structures.

There are a number of studies for which the primary findings have failed to support or have directly refuted the hypothesis of association structural deficit in schizophrenia (Sommer et al, 1960; Moran et al, 1964; Lauro, 1962; Kimmis, 1969; Cohen and Cambi, 1967; Deckner and Blanton, 1969).

Most of the research which has purported to demonstrate deficits in schizophrenic's verbal associative mechanisms, where failure of control measures was not critical, could as well or better be interpreted in terms of set or attentional variables bearing upon the performance task (Buss and Lang, 1965; McGhie, 1969).

On the basis of this interpretation of previous results, and on the basis of the present findings, the conclusion of this paper is that schizophrenic verbal behavior per se is not disturbed, but rather that it is probably appropriate to those aspects of a stimulus situation (both external stimuli and 'ruminations') to which the schizophrenic subject is attending at a given time.



"Consensual" responding on the basis of situational cues, such as that exhibited by normals in giving higher normative-strength responses to words on a free word association task, may be thought of as a "normal response bias". From this point of view the critical schizophrenic deficit may be thought of as the "attenuation of a normal response bias". (Chapman et al, 1964).

If this view of the psychological manifestation of schizophrenic deficit proves to be essentially correct, then the elucidation of how such "attenuation" occurs is intricately tied in with the study of the converse problem: how is the response bias, i.e. the propensity for actively selective perception and attentional focusing, acquired by normals?

If the fundamental "cause" of schizophrenia is found to be a genetically determined metabolic predisposition toward the attenuation of selection aspects of the normal attentional and perceptual processes, then the elucidation of the schizophrenic process could occur through the discovery of the physiological mechanisms which mediate the learning or inheritance, and functioning, of these normal processes. It may be found that these processes never become fully developed in some types of schizophrenia (eg. hebephrenic). In other types of schizophrenia the processes may become temporarily or permanently impaired after normal development (eg. general acute, or paranoid). Furthermore, if a solution to the problem of "attenuation" is found independently in studies of schizophrenia, this discovery should have sweeping implications for the converse problem in normal psychology.



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## APPENDIX

### INSTRUCTIONS

- A) Practice List: I'm going to show you some words together and have you read them together and try to remember them. First I'll give you a short practice list, to give you an idea of how it works. I will put a card with a word on it next to each of the words on this paper. When I put down a word, you are to read both of them together and try to remember them, because afterwards I'll mix all the cards up and then have you try to put them back next to the words they were with before. Do you get the idea? Let's try it. As I put each one down you read the two together out loud. (AFTER FIRST PAIR, S IS REMINDED TO TRY TO REMEMBER THEM.)
- B) Arbitrary List: Good, you've got the idea. Now we'll do the real list. This will be longer and you may have trouble remembering them, but after we try it I'll show you the ones you got mixed up on over again. You'll get more than one try, so don't worry if you don't do too well the first time.
- C) Subjective List: Good. Now I'd like you to try a list just like that except that this time I'll let you put the words together anyway you like. Just take the cards and put one next to each word anyway that you think you can remember them. Remember that there's no right or wrong way to put them and they don't necessarily make sense together anyway, so don't waste time worrying over one word. Just put them down one right after another in any way that you think you can remember them.



WORD LISTS

ARBITRARY

SUBJECTIVE

Stimulus	Response	Stimulus	Response
CITIZEN	HEALTH	LION	LAMP
FOOT	CHAIR	JOY	HIGH
SPIDER	LIGHT	BED	EARTH
NEEDLE	BIBLE	HEAVY	HEAD
RED	CHILD	TOBACCO	STOVE
SLEEP	BITTER	BABY	HOUSE
ANGER	WISH	MOON	ROUGH
CARPET	SOLDIER	SCISSORS	RELIGION
SHEEP	MUSIC	MEMORY	YELLOW
BATH	SLOW	THIRTY	LONG
COTTAGE	COLD	CITY	STEM
SWIFT	WHISTLE	SQUARE	WHISKEY
BLUE	WOMAN	BUTLER	DEEP
HUNGRY	DARK	DOCTOR	SOUR
PRIEST	SWEET	LOUD	TROUBLE
OCEAN	SICKNESS	THIEF	MAN

















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